## *THE AUSTRALASIAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.*

THE third annual meeting of this Association will be held, as we stated last week, at Christchurch, New Zealand. On January 15, the President-Elect, Sir James Hector, F.R.S., will hold a reception in the grounds of Christ's College, and the first general meeting will take place in the evening, when Baron F. von Mueller, F.R.S., will resign the chair, and an address will be delivered by his successor.

The Council of the Australasian Association invite the members of the British Association to attend this meeting, and a circular relating to the matter, signed by Profs. A. Liversidge, F.R.S., W. Baldwin Spencer, and F. W. Hutton, the general secretaries, will be distributed at the Leeds meeting. The cheapest way of reaching New Zealand is by the direct steamers which leave Plymouth every fortnight for Wellington. These steamers call at Teneriffe, Cape Town, and Hobart on their way out, and at Rio de Janeiro and Teneriffe on their way back. In the circular to which we have referred, it is stated that return tickets will be issued to members of the British Association proceeding to New Zealand to attend the Christchurch meeting for £84, which is 20 per cent. below the ordinary return fares. These tickets will be issued by the New Zealand Shipping Company and by the Shaw, Savill, and Albion Company, and holders may return by either line. In addition to this advantage, members of the British Association will be allowed to travel over the New Zealand Government railways (1770 miles) at half fares during January and February.

Visits to places of interest in the immediate neighbourhood of Christchurch will be made during the meeting. After the meeting is over, excursions will be made to the West Coast Sounds; to the top of Ruapehu; and, if possible, to the Upper Rakaia. The trip to the top of Ruapehu will start from Napier, and will be accompanied by Mr. H. Hill. The trip to the Sounds will start from Port Chalmers, and will be accompanied by Prof. Hutton.

Members of the British Association have thus a splendid chance of visiting New Zealand, and of seeing for themselves what is being done in science by our kinsfolk in Australasia; and no doubt a good many will avail themselves of the opportunity. Those who decide to accept the invitation are requested to notify their intention, as well as the name of the steamer by which they propose to go, to Prof. F. W. Hutton, the general secretary in Christchurch, in order that arrangements may be made for their reception. The following steamers will leave Plymouth in time for the meeting:—

| Company. | Steamer. | Leave Plymouth. | Arrive at New Zealand. |
|---|---|---|---|
| N.Z. Shipping Co. | S.S. *Kaikoura.* | Nov. 15, 1890 | Dec. 28, 1890 |
| Shaw, Savill, and Albion Co. | S.S. *Doric.* | Nov. 29, 1890 | Jan. 11, 1891 |

Members going by the *Kaikoura* could visit the Hot Springs district of the North Island before attending the meeting.

## *NOTES.*

NOTHING of scientific value can be extracted from the ghastly descriptions of the recent electric execution. These graphic horrors are too evidently manufactured for sensational or political purposes to be trusted, even had the writers been spectators of the scene. But we may at least gather from them that an entire absence of physiological knowledge, and a very scant acquaintance with elementary physical principles, were exhibited alike by the contrivers of the operation and by the actual operators. With our present physiological knowledge, electric *currents*, whether steady, interrupted, or alternating, are not qualified primarily to produce death, but torture—which, of course, may lead ultimately to death. They have been recommended, in the interests of humanity, as efficient and (if the expression be permitted) healthy substitutes for the "cat." But Nature's own operations, in a thunderstorm, suggest the true substitute for the axe or the cord, viz. the discharge of a condenser of sufficient capacity, charged with so-called "statical" electricity.

THE French Association for the Advancement of Science has been holding its annual meeting at Limoges. The meeting began on August 7, and will come to an end to-day. M. A. Cornu, the President, chose as the subject for his address "the part played by physics in the recent progress of the sciences."

A CONSIDERABLE impetus to scientific study ought to be given by the science scholarships which the Royal Commission for the Exhibition of 1851 is about to establish. They amount in the aggregate to £5000 a year, and are to be used for the benefit of English provincial colleges, and of colleges in Wales, Scotland, Ireland, and the colonies. In accordance with the recommendations of a scientific committee, each of the scholarships will be £150 a year in value, and will be tenable for two years—in rare cases for three; and they are to be restricted to those branches of science (such as physics, mechanics, and chemistry), the extension of which is specially important for our national industries. A series of seventeen scholarships will be allotted to various institutions annually. The first allotment, as the Commissioners explain in a paper they have issued, is to be considered experimental and temporary. "The selection now made of institutions to which nominations are offered will be subject to modification in the future, having regard not only to the manner in which the nominations are exercised, but also to the claims of other universities and colleges which may from time to time be brought under the consideration of the Commissioners."

THE Reale Istituto di Scienze e Lettere of Milan offers prizes as follows:—(1) A historico-critical investigation of works on the variations of climate in geological times (with estimation of hypotheses as to the causes of those changes). Prize, 1200 lire (the lira equals 9½*d.*). (2) A monography of the Protista of spring water in Milan. Cagnola Prize of 2500 lire, and a gold medal of 500 lire. (3) Elucidation, by personal observations, of some points in the physiology of the nervous system, especially the brain. Fossati Prize of 2000 lire. (4) Elucidation of the physiology, or the macro- or microscopic anatomy, of the brain. Fossati Prize of 2000 lire. (5) Draper's theory of the progressive development of the light-rays of a body whose temperature is gradually raised having been attacked by Prof. Weber, a thorough investigation of the phenomena is desired, so as to establish their laws, to exclusion of the ordinary influence of the observer on the meaning of the phenomena. Secco-Commeno Prize of 864 lire. Papers to be written in Italian, French, or Latin, and sent in, with motto, to the Secretary, Palazzo di Brera, Milan. The dates are—for No. 1, April 30, 1891; for Nos. 2 and 3, May 1, 1891; for No. 4, April 30, 1892; and for No. 5, May 1, 1893.

THE Berlin Academy of Sciences has recently granted £60 (each) to Prof. Dames, of the Mineralogical Museum, for a geological investigation of Dalecarlia and the island of Gotland; to Prof. Urban, of the Botanical Garden, for a visit to Paris, to study the specimens of West Indian flora there; and to Dr. Rinne, for study of the Central German basalts. Further, £75 has been granted to Prof. Nussbaum for publication of his studies on Californian Cirrhipedia, and £27 for printing of Dr. Schumann's researches on the union of races. £75 is granted to the Anatomical Society, to further the publication of Prof. His's uniform anatomical terminology.

DR. ST. GEORGE MIVART, F.R.S., has been appointed Professor of the Philosophy of Natural History at the University of Louvain. The professorship is one of those included in the Faculty of Philosophy and Letters.

THIS week the Royal Archæological Institute has been holding its annual Congress at Gloucester. The first meeting took place on Monday, when the chair was taken by Sir John Dorington, in succession to Lord Percy. In his presidential address, Sir John described the neighbourhood of Gleva as it was under Roman civilization in contrast with its later condition in the time of the Saxon invasion.

ON Tuesday the Royal Horticultural Society held a meeting and show in the Drill Hall, and certificates were distributed by the Committee. A paper by Mr. Badger, on fruit-drying by evaporation, as practised in America, was read by Mr. Wilkes, the Secretary. Little fruit, it is said, will be preserved in England this year by the processes described, a worse season generally for plums and apples having seldom been known.

ON Monday the Fellows of the Royal Botanic Society held their fifty-first anniversary meeting. The Council, in their report, congratulated the Fellows upon the firm position held by the Society in the year of its jubilee, and thanked them for their action in response to which 109 new names were added to the list. The result was a permanent growth of prosperity, as shown by the total subscriptions for the year—£3568—which had not been reached since 1885.

THE *Kew Bulletin* for August opens with some interesting notes on Natal aloes, by Mr. J. Medley Wood, the curator of the Natal Botanic Gardens. There are also sections on Gambia mahogany, Ceylon cacao, chestnut flour, wine production in France, and ramie as food for silkworms. The number closes with a list of the staffs of the Royal Gardens, Kew, and of botanical departments and establishments at home, and in India and the colonies, in correspondence with Kew.

IN the new number of the *Internationales Archiv für Ethnographie* (Band iii., Heft 3), there is an article (in German) by Dr. Richard Andree, of Heidelberg, on the Stone Age of Africa. Dr. J. D. E. Schmeltz contributes a finely-illustrated and valuable study (also in German) of decorated weapons used in the East Indies. There is also a short English paper on Zuñi fetiches, by Dr. H. Ten Kate, of the Hague.

THE Japanese collections of Heinrich von Siebold were lately presented to the Hofmuseum of Vienna. They consist of about 5200 specimens, many of which are of great value. In recognition of the donor's generosity, the Austrian Emperor has raised him to the rank of Freiherr.

IN the museum of the Industrial Society of Mühlhausen, there s an interesting ethnographical collection, including a number of fine American antiquities. The objects are being rearranged by Herr E. Grosse.

A WORK on Hindoo folk-lore has just been issued from the London Printing Press at Lucknow, the author being Rai Bahadur Mal Manucha, chairman of the Fyzabad Municipal Board, and well known in Oudh as a legal practitioner. In the preface he says that while he was enjoying the vacation at Hardwar on the Ganges, it occurred to him that if a few notes on religious beliefs, social customs, superstition and folk-lore, proverbs and sayings, puns, riddles, aphorisms, and other miscellaneous matters in common vogue among the Hindoo community generally, and among the country people especially, were brought together, they would "aid a great deal in throwing light upon the hitherto partially explored regions of the mode of life led by the common people." In a lengthy article on the little book the *Times of India* says the author has gathered together a little of everything that his preface promises. We learn, for instance, that if a person is drowned, struck by lightning, bitten by a snake, or poisoned, or loses his life by any kind of accident, or by suicide, then he goes usually to hell. If he die naturally on a bed or a roof, he becomes a "Bhut," or evil spirit, and with this belief care is taken on the approach of death to move the person carefully on to the floor. The earth is believed to be resting on the horn of a cow and the raised trunks of eight elephants, called "Diggai," or "elephants supporting the regions," and each of the cardinal and sub-cardinal points of the compass has its appropriate guardian. An eclipse is produced by the occasional swallowing up of the sun or moon by the severed head of Ráhu, son of a demon family, who was decapitated by Vishnu for disguising himself as a god and drinking nectar.

IN the thirteenth of his "Res Ligusticæ," recently published, Count Salvadori announces the occurrence of *Cypselus affinis* in Liguria on May 14 last. The Count gives full synonymy of the species, and an interesting account of the species on this its first visit to Europe.

IT has been known for some time that Dr. Loria was engaged in prosecuting zoological researches in the Papuan sub-region, and now two instalments of his collection have been described by Count Salvadori. The localities visited by the Loria expedition have been Pulo Penang, Timor Cupang, Pulo Semau, Port Darwin, and Port Moresby in South-Eastern New Guinea. Three new species have been discovered in the latter locality, and have been named by the author, *Ægotheles loriæ*, *Arses orientalis*, and *Pitta loriæ*, the last-named being the only species collected on the island of Su-a-u, a small islet near South Cape.

PROF. GIGLIOLI has just issued the second part of his "Primo Resoconto dei risultati della inchiesta ornitologica in Italia," the first portion of which we noticed last year. This second instalment is in the form of a goodly octavo volume of nearly seven hundred pages, and is entitled "Avifauna Locale." It consists of reports from the various provinces of Italy, furnished by different observers, with remarks as to the nidification, distribution, and migration of the various species. As to the value of these local lists there can be no question, and Prof. Giglioli may be trusted to choose men with a thorough knowledge of local ornithology to record the observations. As far as we can judge, Prof. Giglioli has been fortunate in his coadjutors.

THE problem as to the origin of the nephrite of which the tombstone of Tamerlane, at Samarcand, is made—a question which has interested a good many mineralogists—seems to have been definitely solved by M. Grombchevsky's visit to the nephrite-mines on the Raskem-daria, on the eastern slope of the Pamir. M. Grombchevsky found there a big dyke of nephrite, of extreme hardness, embedded in the rocky banks of the Raskem-daria, which consist in that place of white jadite. The Chinese used to extract the nephrite by lighting great fires on the rock, and afterwards throwing water on it when it was heated. They stopped these operations in the course of the present century, when the heir to the throne, after having slept in a bed made of Raskem nephrite, fell ill. A large piece of the stone, so much liked by the Chinese, which was on its way to Peking, was put in chains (like Yakoob-Beg's guns, which are still kept in chains at Yanghi-ghissar) and thrown on the road-side at Kutcha, where it remains. After a careful analysis of the samples brought by M. Grombchevsky, Prof. Mushketoff (in the *Izvestia* of the Russian Geographical Society, xxv., 6) comes to the conclusion that the Raskem nephrite and that of Tamerlane's tombstone are identical.

As to the white jadite in which the dark nephrite is embedded on the Raskem-daria, and which was extracted by the Chinese on the Tunga River, it is like the jade obtained in Burmah on the tributaries of the Irawadi, and described in a recent issue of the *Scottish Geographical Magazine.*

SOME curious results have appeared in an examination, by Herren Geisler and Ulitzsch, of school children in the (Saxon) Freiberg district, with reference to growth (*Humboldt*). Twenty-one thousand children (of both sexes) were measured. The boys, up to the eleventh year, were found to be about 0·6 to 0·9 cm. taller than the girls; but they were then overtaken by the girls; and this superiority of the girls continued till the sixteenth year, when the boys again grew more than the girls. This is against Quetelet's opinion, that boys are throughout bigger than girls.

THE Liverpool Geological Society has issued Part II. of the sixth volume of its Proceedings. Among the contents is an address by the President, Mr. H. C. Beasley, on the life of the English Trias. Mr. T. Mellard Reade contributes geological notes on an excursion to Anglesey; a note on a boulder met with in driving a sewer heading in Addison Street, Liverpool; and a note on some mammalian bones found in the blue clay below the peat-and-forest bed at the Alt mouth.

AT the meeting of the Linnean Society of New South Wales on June 25, Mr. Fletcher exhibited one living and several spirit specimens of *Notaden Bennettii*, Gthr., from three different localities—namely, Dandaloo, on the Bogan River (collected by Mr. A. Fletcher), Warren, on the Macquarie (collected by Mr. Thacher), and Narrabri (collected by Mr. Henry Deane). He remarked that though this toad has hitherto been rare in collections, it is at times not uncommon in its native haunts. In two of the localities above named he had been informed that during April and May of this year considerable numbers had appeared, though possibly the recently prevalent floods may have been concerned in bringing them prominently under notice. From what he had seen of living specimens in captivity, the animals were expert burrowers; and from what he had heard as to their avoidance of water, their comparatively sudden appearance, followed shortly afterwards by a noticeable diminution in numbers, he was inclined to think that the species perhaps resembled the American spadefoot toad (*Scaphiopus*) in keeping generally out of sight except during a short breeding period. Mr. Ogilby remarked that Mr. Helms, who is away on a collecting expedition for the Australian Museum, had recently sent down specimens of the same species from Bourke.

SOME habits of crocodiles have been lately described by M. Voeltzkow. Travelling in Wituland, he obtained in January last 79 new-laid eggs of the animal, from a nest which was five or six paces from the bank of the Wagogona, a tributary of the Ooi. The spot had been cleared of plants in a circle of about six paces diameter; apparently by the crocodile having wheeled round several times. Here and there a few branches had been laid, but there was no nest-building proper. The so-called nest lay almost quite open to the sun (only a couple of poor bushes at one part). The eggs lay in four pits, dug in the hard, dry ground, about two feet obliquely down. Including eggs broken in digging out, the total seems to have been 85 to 90. According to the natives, the crocodile, having selected and prepared a spot, makes a pit in it that day, and lays about 20 to 25 eggs in it, which it covers with earth. Next day it makes a second pit, and so on. From the commencement it remains in the nest, and it sleeps there till the hatching of the young, which appear in about two months, when the heavy rain period sets in. The egg-laying occurs only once in the year, about the end of January or beginning of February. The animal, which M. Voeltzkow disturbed, and saw drop into the water, seemed to be the *Crocodilus vulgaris* so common in East Africa.

IN the last official report from Gambia, the Colonial Surgeon has an interesting paragraph on native diseases. The natives of Africa, he says, who are world-renowned for their superstition, attribute all diseases to one of two causes: either they have been "witched," or some enemy has made "greegree" against them. Of the latter there are two forms: (*a*) the "greegree" that is administered to a person, and most usually consists of an infusion made of roots, leaves, or bark from trees supposed to have the desired properties; (*b*) the "greegree" that is prepared against a person. This is done with much ceremony, and the process is accompanied by incantations, recalling the scene of the "witches' cauldron" in "Macbeth." The treatment relied upon for cure, and much practised in the country, is to call in a man who is supposed to be a "doctor," who, after looking at the patient, sits down at his bedside and writes in Arabic characters on a wooden slate a long rigmarole, generally consisting of extracts from the Koran. The slate is then washed, and the dirty infusion is drunk by the patient. As a result of this state of ignorance and superstition, unqualified practice of every description is openly carried on, and drugs and poisons are daily sold by persons who are wholly ignorant of their properties, but who have acquired sufficient influence over ignorant patients to extort money.

THE *Deutsche Seewarte* has just published in a tabular form the results of the meteorological observations made on German and Dutch ships for the ten-degree square, lat. 20°–30° N., long. 30°–40° W., situated in the centre of the North Atlantic. This is, in fact, the eighth such square which has been similarly published in the last few years; the results for each month are grouped in one-degree squares, of which there are one hundred in each ten-degree square, and the observations for any part of such sub-square are so grouped as to be readily available for combination with the materials collected by other institutions. The winds are recorded under 16 points, with additional columns for variable winds, calms, and storms. Other columns include the means of the various data, the duration of rainfall, and remarks of special interest extracted from the logs used in the discussion. The volume contains xxvi. + 193 large quarto pages.

IN the third number of the *Sammlung von Vorträgen und Abhandlungen*, Prof. Foerster, the Director of the Berlin Observatory, has brought together seven lectures delivered by him in recent years to scientific societies and artisan audiences in Berlin and Hamburg, and various papers reprinted from *Himmel und Erde*, the Prussian *Normal Kalender*, and other sources. Four of the lectures have relation to standard time, the universal meridian, and the Washington Conference; others are included in the prediction of earthquakes and meteorological phenomena, luminous night clouds, the red skies which followed the Krakatão eruption, and Karl Braun's cosmogony. In a paper on the zodiacal light, it is held that, although the constitution of the light is still a matter of doubt, the evidence gained by means of the spectroscope and polariscope indicates that it consists not merely of sunlight reflected from bodies of a meteoritic nature, but also of innate light, due, probably, to electrical effects in a gaseous medium. A paper from the *Kalender* for 1891 contains an account of recent work done at Potsdam on the motion of stars in the line of sight, the instruments employed in the investigation being fully described. Prof. Foerster enjoys some renown in Germany as a popular exponent of scientific questions, and numerous reprints of his papers and discourses have appeared.

THE demand for techical education in New South Wales is rapidly increasing both in Sydney and in the principal centres of population throughout the country. At present there are between 3000 and 4000 students enrolled, as against a total of 2200 this time last year. A tender has been accepted for the erection of a new technical college in Sydney, to cost £19,537, and the building is to be completed by March next.

THE American journal *Bradstreet's* in a recent article describes a school of manual training at Baltimore, which claims to be the pioneer public manual training school, as well as the only absolutely free school of the sort in the world. The school was opened in 1884 with sixty pupils and four instructors; now it has 549 pupils and fifteen instructors. It has had manual training for its chief object. The ordinary work of advanced public school grades is here but a department called the literary department. This is an essential difference from the manual training in so many schools, where it is one feature of many, and not the chief. It is not meant to teach trades, but rather the use of the tools used in all common trades, and the rudiments of mechanical industry. The regular course of the school takes three years, but there is a preparatory course of two years for the benefit of those who could not continue the ordinary public school course. All the students have their daily work in the shops, drawing-rooms, physical laboratory, and literary department. Each class has its own recitation-room, and only leaves it for drawing, shop, and laboratory work. In shop work the classes are limited to twenty-four boys, while in drawing and other studies double that number are instructed at a time. In the first year fifteen weeks are devoted to carpentry, five to wood-turning, and twenty to forging. In the second year fifteen weeks are devoted to pattern-making, five to moulding, fifteen to vise-work, and five to soldering and brazing. In all the shops instruction is given as to the care and use of tools, laying off and designing work, and the composition of the material used. Each class makes some special design for graduation, and the class this year is engaged on a ten horse-power dynamo, thirteen lathes, and a Gordon printing press. The dynamo will be set up, and is expected to furnish electricity enough to light both buildings with incandescent lights. The boys also do all the plating required, and make all repairs on the machinery in use.

THE additions to the Zoological Society's Gardens during the past week include an Ashy-black Macaque (*Macacus ocreatus*) from the East Indies, presented by Mr. W. J. Bosworth; a Two-banded Monitor (*Varanus salvator*) from the East Indies, presented by Captain W. J. Rule; a Wapiti Deer (*Cervus canadensis* ♀) from North America, an Aard Wolf (*Proteles cristatus*) from South Africa, two Patagonian Conures (*Conurus patagonus*) from La Plata, purchased; two Ariel Toucans (*Ramphastos ariel*) from Brazil, received in exchange; a Barbary Wild Sheep (*Ovis tragelaphus*), born in the Gardens.

## OUR ASTRONOMICAL COLUMN.

### OBJECTS FOR THE SPECTROSCOPE.

Sidereal Time at Greenwich at 10 p.m. on August 14 = 19h. 33m. 5s.

| Name. | Mag. | Colour. | R.A. 1890. | Decl. 1890. |
|---|---|---|---|---|
| | | | h. m. s. | ° ′ |
| (1) G.C. 4510 ... ... | — | Pale blue. | 19 37 45 | +14 25 |
| (2) G.C. 4514 ... ... | — | Greenish-blue. | 19 41 56 | +50 15 |
| (3) δ Sagittæ... ... ... | 4 | Yellowish-red. | 19 42 29 | +18 16 |
| (4) β Aquilæ... ... ... | 4 | Yellow. | 19 49 54 | + 6 8 |
| (5) δ Aquilæ... ... ... | 3·4 | White. | 19 19 54 | + 2 54 |
| (6) 483 Birm. ... ... | 7 | Very red. | 18 58 32 | − 5 49 |
| (7) S Scorpii ... ... | Var. | — | 16 11 7 | −22 37 |

*Remarks.*

(1) This is a small planetary nebula which gives the usual spectrum of three bright lines, in addition to a comparatively distinct continuous spectrum of considerable length. In further observations special attention should be directed to the character of the chief line, and maxima of brightness in the continuous spectrum should be looked for. It is not improbable also that many faint lines may be found with the improved instruments now in use. In the General Catalogue the nebula is thus described: "A planetary nebula; bright; very small; round."

(2) This is one of the so-called "nebulous stars" appearing in ordinary instruments as a star out of focus. The central nucleus gives a continuous spectrum, but the surrounding atmosphere gives a spectrum consisting of three bright lines. It would be a considerable advance in our knowledge if the spectrum of the nucleus could be determined. It may be that we are simply in presence of a star like those of the Pleiades, produced by the intersection of streams of meteorites, or it may be an ordinary case of condensation of a nebula. In the former case the spectrum would probably be that of a hot star, whilst in the latter case it would be one of an early group, possibly consisting of bright lines. Further observations are obviously required. The General Catalogue description is as follows: "A nebulous star; bright; pretty large; round; star of 11th magnitude in the middle."

(3) A bright star, with a well-marked spectrum of Group II. The bands 2, 3, 7, and 8 are strong, and 1, 4, 5 are well seen (Dunér). The usual observations for bright carbon flutings and absorption lines are required.

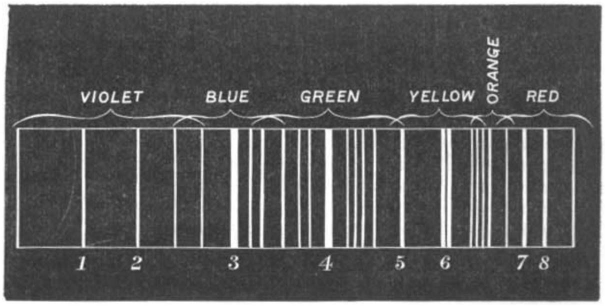
(4) and (5) Gothard states that these are stars of the solar type and of Group IV. respectively, the former being confirmed by Vogel. The usual more detailed observations are required in each case.

(6) This is a comparatively bright star of the rare type of Group VI., and offers a good opportunity for a detailed study of this kind of spectrum. In addition to the three usual carbon bands, it shows the secondary bands 4 and 5 (Dunér). The intensity of band 6 (λ 564), as compared with the other carbon bands, is not recorded by Dunér. The presence or absence of line absorptions should be particularly noted.

(7) The spectrum of this variable has not yet been recorded. According to Gore's catalogue, the period is about 177 days, and the magnitude ranges from 9·1–10·5 at maximum to < 12·5 at minimum. There will be a maximum about August 19.

A. FOWLER.

LIGHTNING SPECTRA.—Mr. W. E. Wood, in the current number of *The Sidereal Messenger*, gives the results of some observations of lightning spectra made on June 22, 1890. The results were obtained with a Browning direct-vision spectroscope of small dispersion, and having no scale, so that the lines mapped in the accompanying diagram are eye estimates.



With respect to the 25 bright lines shown it is remarked, "two moderately bright lines lie in the violet, one heavy bright line in the blue, and which I estimate to be the familiar F line, one brilliant line in the green (the coronal or auroral line?), one brilliant line on the yellowish-green, a double line in the yellow —very brilliant (the sodium line?), a fainter but fairly broad line on the edge of the red, and two very bright lines in the centre of the red, one of which I think is a hydrogen line. The fainter bright lines lie approximately as shown in the diagram. The intense flashes, those which usually do the damage during a storm, gave *exceptionally* faint, continuous spectra, and rarely more than the lines number 3, 4 and 5. Heat-lightning flashes gave the principal bright lines 1 to 8, and the spaces between were occupied by a multitude of finer bright lines. An absorption band in the violet occurred in all *bright* flashes of heat-lightning, and in some cases I saw two